ON SCENE

THE NATIONAL MARITIME SAR REVIEW

DEPARTMENT OF TRANSPORTATION

U. S. COAST GUARD

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Where Should We Have The Helicopter Land?

By LTJG PENN SHADE, CGAS MIAMI

Frequently SAR units in this District call upon one of the Air Stations to provide a helicopter to evacuate injured persons. Often helicopter pilots are requested to evacuate people from more confined or remote areas. With regard to confined area operations there are several points which should be made. If the surface SAR units can be made aware of what conditions combine to make a good helicopter landing site, the pilot's job will be made easier and the entire rescue operation can be completed effectively, efficiently, and safely.

When a helicopter arrives on scene for evacuation, invariably the first item of business is to recon the area and evaluate the landing site. There are several considerations in selecting a suitable landing site. These include, but are not limited to wind, obstacle clearance, surface lighting (if at night), security, and communications. If SAR units have these things in mind when selecting the area to which they are calling a helicopter, operations should run smoothly.

Probably the first thing that a pilot does is to determine the direction from which the wind is blowing. This is done by observing windsocks, smoke, trees, wind streaks on the water etc. The direction of the wind coupled with obstacle clearance (which will be discussed later) are the two most important factors in making an approach into and landing in an area other than an established airport or heliport. Ideally the pilot likes to land directly into the wind. A tail wind or crosswind affects both the performance and maneuverability of the aircraft. If a crosswind must be accepted, then it should be minimized as much as possible.

Having evaluated the wind conditions the pilot directs his attention to the obstacles that surround the proposed landing site. Pilots are reluctant to make approaches into areas where tall trees, power lines, or buildings lie in the flight path. The inherent danger is obvious. Not only is there an increased risk of striking an object, but should a power loss occur the pilot has no choice but to attempt a landing into the trees, power line etc. The approach then, if possible, should be over a clear area and into the wind. Very few

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cases arise, though, where the approach is directly into the wind and over a perfectly clear area; however, the pilot selects an approach which provides the best combination of these two variables.

Also to be considered when speaking of obstacle clearance are paths for departure and discontinued approaches. If a pilot gets into an area, does he have room to get out? Can he depart reasonably into the wind with obstacle clearance? Is there a clear area in the event of power loss? What if an unsafe condition arises and the pilot must discontinue his approach from an altitude of thirty feet; is there an avenue for departure? Only the pilot in his professional opinion can make these judgments before each landing, but they are items that other SAR units can be aware of. Generally, the more open the proposed landing site is, the more suitable it becomes.

Another item of significant importance is the general condition of the landing surface. Clear, level pavement or other hard surface is preferable. If there is an accumulation of debris in the immediate vicinity, it presents a hazard in that rotor wash can propel loose objects into the engine intake. The result is obvious. While helicopters certainly can land on sand it is undesirable. Sand blown by rotor wash can at times reduce the pilots visibility, and it accelerates engine wear.

If the evacuation occurs during hours of darkness, lighting can be important. Well-lit areas improve the pilot's depth perception, but personnel should guard against improper or careless use of lights. Make sure no floodlights are pointing upwards into the approach path. Also, take care not to shine lights directly into the cockpit. This can blind a pilot. A useful suggestion might be to form a large square with cars and turn the headlights on. This lights the landing area quite well.

The last two items to be discussed are security and communications. Although not so critical, these two items lend safety and efficiency to the operation. If local law enforcement officials are available they can be effectively employed by keeping curiosity seekers away from the immediate vicinity of the landing site. This reduces the potential for injury to unfamiliar people.

Finally, a word about communications. If some facility has compatible radio capabilities the pilot can advise and be kept advised of developments as they occur. A compatible radio which works well is the hand held 802 walkie-talkie.

It is hoped that this exchange of information will help convey to other SAR units some of the factors considered in landing site evaluation. If some pre-selection can be done by SAR units prior to the arrival of the helicopter, minimum delay will result and the unnecessary movement of injured people will be prevented.

Editors Note: *Our thanks to the Miami SAR Coordinator Newsletter from which we reprinted this article. The objective of the article is to give surface units an insight into the helicopter pilot's problem when faced with a requirement to land at a strange landing site.*

Aircraft Emergency Transponder Codes

On 9 September 1976 the aircraft emergency transponder code denoting that an aircraft is being subjected to unlawful interference will be changed from 3100 to 7500 on civilian Secondary Surveillance Radar Modes A and B. Mode A corresponds to the military Mode 3 on IFF/SIF equipment.

ESTABLISHING SEARCH PRIORITIES

By MAJ Robert J. Mattson, USAF

Establishing search areas for either a missing aircraft or a missing person generally can be divided into two phases, the initial search and the subsequent search phase. Underlying both phases is the unending quest for information which starts with the initial notification. Continually, information which may or may not help in finding the survivors will be received. Every piece of information must be reviewed and placed in perspective; asking the following questions may be of assistance:

> Is the information RELEVANT? Will the information be of any assistance in helping find the survivor?
>
> Is the information TIMELY? Did the lead occur at a time that is within the realm of possibility?
>
> Is the information RELIABLE? Look at the reporting source for sincerity and motivation.
>
> Is the information COMPLETE? If not, do what is necessary to gather complete information and your efforts will be rewarded by a shortened search and an increase in the number of lives saved!!

This process of gathering data is one of the most important in any search effort and should NEVER stop: DIG! DIG! DIG! for more and more information!!!

Early in any mission the Search and Rescue Mission Coordinator (SMC) is faced with the problem of assigning a limited number of resources to search areas. Frequently, this decision must be made based on little information which is sometimes contradictory and may be unreliable. But, because of the urgency of the situation he may be compelled to start the search even if he would rather wait for additional information or appropriately trained search personnel and equipment (tracking specialists, dogs, helicopters, etc.). At this time the best search areas are probably around the last known position and along the most probable routes. I firmly believe, and statistics will bear me out, that you will find most of your survivors during the initial search effort and the SMC should attempt to cover as much area as rapidly as possible. During this stage of the mission you are looking for the cooperative survivor, one who will signal or respond to your presence, and for obvious crash sites or anything unusual which may lead you to the survivors. Therefore, it is appropriate to use a wider track spacing than you would for an unresponsive victim or for a hidden crash site. During this phase, information is changing rapidly and things are happening too fast to really establish formal search priorities. Probably the best tool you have for establishing priorities is "COMMON SENSE", and the experience of those initially on scene. A review of the studies conducted by the National SAR School concerning aircraft crash location and an analysis of travel patterns of lost persons by William Syrotuck, may be of some assistance and guidance in establishing search priorities and area size. But you must remember that every SAR case is a unique one and must be treated as such; look at all the facts and use your "COMMON SENSE"!!

Sometime during the first day or night the SMC is going to think about what must be done next, and it is at this point that the second phase of search area planning is entered.

When planning for subsequent

searches the SMC must take into account ALL of the facts and consider all of the assumptions that are pertinent to the case. One method of distilling the information into a useful product is to start a list of possibilities and facts as they come to your attention. This list should be started at the time of initial notification, and items such as possible routes, weather, difficult terrain, probable reaction of the individual to various possibilities, historical pattern of others lost in the area and anything else that might have a bearing on where the survivors may be found should be added as discovered during the initial phase. These items will be brought out by the many individuals who will be involved and it is important that nothing is lost or overlooked due to the confusion inherent in the initial response. If the SMC has this list he can be confident that ALL of the information that was available to him will be considered when establishing subsequent search area priorities.

When the SMC is ready to plan for the next search he should consult his list and discuss the information with others who are experienced, knowledgable and/or involved in the search effort. Additional items will most likely be added since it is probably the first time that many of the major participants will meet. Next, the possible routes, positions and areas where the survivors may be found should be listed, and thoroughly discussed. Each person should be asked to assign a percentage of probability to each item and each list should total 100%. To get the consensus you simply take the average.(see example 1)

It is best to have each person assign his percentage privately (secret ballot style) because it will insure that even the meeker individuals will be able to express his opinions without being intimidated by the more vocal members of the group. If the consensus is gathered verbally, you will probably end up with the opinion of only one or two aggressive individuals and may run the risk of polarizing the group toward conflicting ideas which may detract from the efficient operation of the search. Additionally, since everyone is involved in the decision making process they will be more inclined to support the final decisions made by the SMC, which will result in a more efficient operation. Most people find that assigning a numerical value to the various possibilities is a very challenging task. This is probably the first time that they have been forced to relate each possibility in comparison to the others, but hopefully, the process will result in a realistic appraisal of the situation. Two rules go along with this technique:

1. NEVER SEARCH PLAN BY YOURSELF
2. NEVER DISCARD INFORMATION

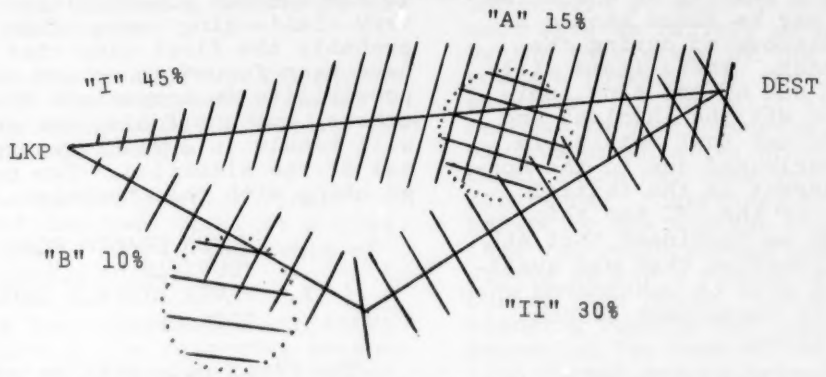
The first rule will be obvious once you try this method! There will be no two lists of probabilities the same, since we all have some preconceived ideas and no matter how hard we try to be objective we still tend to favor one line of thought over another. We must have help in overcoming our narrow-mindedness; since we do not KNOW where the survivors are how can we say where they are not (if the information is within the realm of possibility)? Granted, we've had our reasons for discarding information in the past but these "far out" leads could better serve us if they were included in our search plan with very low probability (i.e. 0.5%, 1% or 5%), occasionally, one of these leads will be just what is needed to take advantage of new information. Please keep an open mind, don't discard any possible information and keep everything in perspective. Always remember: IF YOU KNOW WHERE THE SURVIVORS ARE,.WHY ARE YOU SEARCHING!!!!????

When the process is complete, which should take 10 - 30 minutes, the SMC has the consensus of the most informed and experienced personnel available and he should be able to use this consensus to help him establish search area priorities for the next search. A method of getting a visual picture of the consensus is to draw each possibility on a map or overlay and to shade each possibility according to its probability percentage. (see example 2)

EXAMPLE 1

PERSON	"A"	"B"	"X"	"Y"	TOTAL	CONSENSUS
ROUTE I	40	50	50	40	180 ÷ 4 =	45%
ROUTE II	30	30	20	40	120 ÷ 4 =	30%
POSITION A	20	10	20	10	60 ÷ 4 =	15%
POSITION B	10	10	10	10	40 ÷ 4 =	10%
TOTAL	100%	100%	100%	100%		100%

EXAMPLE 2



NOTE: From this graphic you should find it easy to establish search area priority. (The extra width along the track lines represent the navigation errors). The first priority seems to be in area "A", the second could be where routes "1" and "2" overlap and the third might be Lead "B".

This consensus may be used to establish search priorities and the SMC can be confident that he is assigning search units to the highest probability areas first, within the limitations of weather, terrain and capability of the personnel/equipment. This is the beginning of optimal search planning, but many more variables must be considered before the most efficient and effective search can be planned.

If you use this procedure early in the search you will consider all available data, tap the knowledge of the best minds available, and this will give the survivors the best chance of being recovered alive. Good Luck!

Editors Note: *Major Mattson is one of the Air Force instructors at the National SAR School. A short while ago while I was visiting the school I sat in on a search planning class. The students were engaged in something called consensus planning. On request, Major Mattson kindly provided the above article which he had prepared as a handout. Although the article deals with overland search planning, it doesn't take much imagination to see how the concepts can be used in overwater situations also. In fact it sounds like one of the best ways to arrive at the initial weighted probabilities needed in the Computer Assisted Search Planning System(CASP).*

CAPSIZING OF BOATS--A SPECIAL SAR PROBLEM

By Mr. Henry Winters

The search for missing boats is a very common SAR activity, both on inland waters and on the ocean. When a boat is suspected of having capsized it becomes a race against time. There is a vast difference in the survival time of people drifting in a boat with a dead engine than in the case of desperate survivors clinging to an overturned hull. The difference can be measured in days versus minutes, or in life versus death. U. S. Coast Guard statistics point to capsizing as the single largest cause of drownings in boating accidents, year after year.

In this article I will discuss conditions that cause boats to capsize and the chances of various boat types to resist that tendency. While capsizing is a rare occurrence, compared to the total number of boats, under certain conditions no vessel is completely immune to this calamity. Even large ocean liners have succumbed to capsizings, usually after taking on water after collision.

If the SAR coordinator can get the information as to the boat type and loading condition of the missing boat, he can superimpose that information on the prevailing sea conditions in the area and come up with an estimate of the condition of the boat and probability of survivors. This in turn would help him direct the SAR teams more effectively by having a better understanding of the casualty profile.

EXAMPLES OF CAPSIZINGS

I'll begin with a thumbnail sketch of two typical SAR cases involving capsized boats.

CASE A: Two men in an outboard powered boat fail to return from a fishing trip in the Gulf of Mexico. The Coast Guard is notified by the families and initiates an extensive air/sea search: a private plane joins in the search, but no trace of the boat or survivors is found. On the third day of the search a Coast Guard cutter sights the boat floating bottom up, with the two men clinging to the keel. Even though the survivors saw the search planes, they were not spotted from the air, as the visible portion of the hull was very small and matched the gulf waters in color. The survivors were in no condition at any time, or had the means, to signal the planes.

CASE B: In this case, a utility boat returning at night from the Atlantic, is overtaken by a breaking wave while negotiating an ocean inlet. The boat capsizes. Two crewman are trapped inside the forward cabin. The coxswain manages to swim clear and hangs onto the propeller shaft of the overturned boat. Even though the boat was well equipped with radios and other signalling equipment the crew had no advance warning or chance to send a distress signal prior to capsizing. In the early morning hours the overturned boat is located and after an extraordinary effort the boat is righted and the trapped men are rescued. Even though the temperature was in the thirties the men survived because they were wearing "wet suits". In a similar case where the crew was not wearing "wet suits" two crewmen succumbed to the cold and drowned.

The main point is that capsizings happen fast, most of the

Editors Note:

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time without any warning. The time it takes for a boat to capsize is related to its natural period of roll. This takes from two to eight seconds on most boats and does not give the crew and passengers enough time to prepare for their ordeal in the water. In fact, if life jackets are not worn at the time of capsizing, they rarely have time to grab for them.

DEFINITIONS:

"Capsizing" means that the boat rolls over about 180 degrees and remains afloat for a period of time in the upside-down position. This may last from several minutes to days, depending on the watertight integrity, subdivision of the boat and flotation installed onboard. A boat may capsize due to dynamic forces of large waves, collision, violent maneuvers or due to impaired stability caused by high and shifting loads of personnel, cargo or sea water shipped on deck, free surface water sloshing around in the bilges, or icing of top sides. Usually, a boat capsizes due to a combination of several of these factors.

"Knock Down" is a term applicable to sail boats, meaning that the wind knocks the boat over to about 90 degrees. The boat may then right itself, remain floating on its side, or even sink, depending again on its weight distribution and watertight integrity.

TYPES OF BOATS---CHANCES OF SURVIVAL

When talking about boats we have in mind vessels up to 100 feet in length, propelled by motors, sails, oars or paddles.

Generally speaking, the smaller and lighter a boat, the easier it will capsize when handled by an unskilled crew and under adverse weather conditions. Most boats are designed for a specific application. They are safe, if used with skill and prudence within their limitations.

U. S. Coast Guard Motor Life Boats, while not excessively large, can survive severe weather and heavy seas. Even if capsized, the boat will right itself with engines running and the crew ready to continue their mission.

On the opposite extreme, a car top boat (i.e. one which is designed to be carried on top of a car) is light and small for obvious reasons and must not be exposed to heavy weather even on a lake.

Prior to initiating a search for an overdue boat the SAR coordinator should attempt to establish the general boat type, loading and sea conditions in order to establish a probable casualty profile. Following is a description of the typical boat types, divided into groups according to their chances of survival under various sea conditions:

a. CAR TOP TYPE BOATS - 8 to 15 FEET:

Normally not over 180 lbs. They are usually provided with flotation and will not sink even if swamped or capsized. Occasionally these boats happen to capsize even in completely calm water and will stay afloat upsidedown with the crew hanging onto the bottom of the boat. If the water temperature is cold the crew will not hold on very long before slipping under and drowning. There are reports of boats capsizing with only one man onboard, standing up to urinate. Once capsized, these boats are difficult to right, except by a very skilled crew. The chance of spotting a small capsized boat from the air is minimal except in clear visibility, calm seas and daylight. The drift of a capsized boat is more dependent on currents than wind or wave direction.

b. OPEN BOATS - 15 to 24 FEET, OUTBOARD POWERED:

These boats are generally beamy and stable and, if less than twenty feet long, they must by law be provided with built-in flotation. They are likely to swamp and capsize if exposed to very heavy weather or overloading. The water temperature will again be a determining factor for the survival time.

c. CABIN CRUISERS & FISHING BOATS - 24 to 45 FEET:

These are generally stable boats that are unlikely to capsize unless damaged or shipping water due to heavy seas. These boats will sink if swamped. When capsized some air may be trapped in the hull, allowing the boat to remain afloat for a lengthy period of time. Under these conditions the surviving crewmen are more or less helpless. Fast motor boats with a high flying bridge are more susceptible to capsizing, especially if handled or loaded without regard to good seamanship.

d. MOTOR YACHTS & FISHING BOATS - 40 to 100 FEET:

They are, as a rule, very safe, particularly if built to U. S. Coast Guard or a classification society rules. Some capsizings have occurred, usually due to damaged stability resulting from water entering the hull, either via open hatches, broken windows during severe storms or due to hull damage caused by collision, damaged piping or grounding. The boats are normally outfitted with radios and signaling devices and in all but the most extreme cases they will have the time to send a distress signal.

e. BOARD TYPE SAIL BOATS AND CATAMARANS - 10 to 15 FEET:

These are likely to capsize in any weather. If capsized they float and can be righted by a skilled crew. In the hands of the unskilled crew they can be very dangerous. Life jackets should be worn at all times and "wet suits" during cold weather sailing.

f. SMALL OPEN SAIL BOATS, CENTERBOARD TYPE - 14 to 24 FEET:

These can capsize in winds of 15 knots and over or by sudden gusts as in thunder storms. The boats normally stay afloat, lying on their side, but are difficult to right. They are easier to spot from the air than capsized power boats, due to the sails lying on the surface of the water.

g. OCEAN SAILING YACHTS - 30 to 100 FEET:

These are normally provided with deep ballast keel, watertight decks and self-bailing cockpits. If knocked down they will right themselves. A well found ocean sailing yacht can survive in nearly all weather conditions including hurricanes, if handled expertly. If holed they are likely to sink due to their heavy ballast keels. Yachts of this type have been found drifting on the ocean, weeks after their crews were presumably lost overboard. Generally speaking, this boat type with an experienced crew is quite safe. Occasionally these deeper boats do run aground at the approaches to a strange harbor, but unless they are in a surf line they are usually not in immediate danger and may get off with the next tide.

CONCLUSION

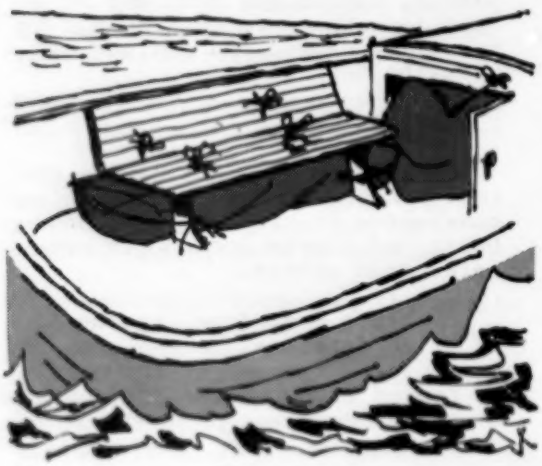
Capsizings do not happen often. Under a combination of circumstances it can happen to any boat; of course some boats are safer than others.

When a boat does capsize it is often fatal, since the crew and passengers, trapped in the boat or tossed into the sea, are unable to help themselves or send a distress signal.

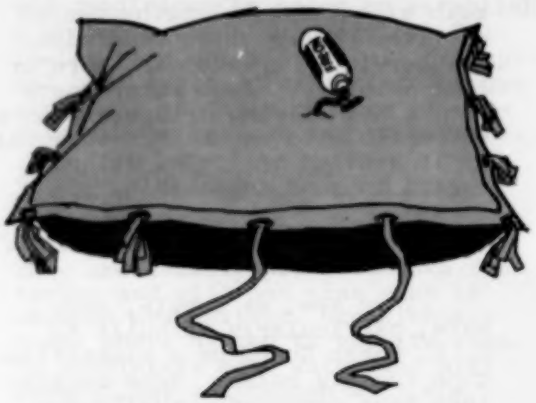
Cont...on page 11

SMALL BOAT EMERGENCY FLOTATION BAG

For those of you who are not yet familiar with the Emergency Flotation Bag (EFB), it is an inflatable bag which has been developed by the Coast Guard for use as a supplement to dewatering pumps to prevent the sinking of damaged, capsized and/or foundering boats. Several of the bags can provide enough temporary buoyancy to allow a boat to be towed ashore rather than have it sink (the larger the boat the more bags are required). Each EFB provides approximately 450 pounds of buoyancy. They are intended to be placed into compartments (of a sinking boat) or lashed to fixtures, under gunwales etc. (each bag is equipped with straps for lashing), and then activated to expand.



A limited quantity of EFBs was recently distributed to Coast Guard units with SAR boats attached. Those units were selected as they were considered the units most likely to render aid to sinking small boats. Allowances for the bags are to be established by district commanders. The operation, inspection, maintenance and evaluation instructions for the EFB are contained in COMDTINST 9940.2. There are presently no EFBs in stock as all bags manufactured to date have been distributed. However, the Coast Guard Supply Center, Brooklyn is presently in the process of procuring additional bags for stock. The bags have been assigned Coast Guard Stock No. CG-2090-G00-4472, and should cost less than $60 each.



The EFB is constructed of international orange colored coated cloth (similar to that used in the construction of life rafts) and is inflated with a disposable 2-pound can of Freon 22. Freon 22 (2 lb. can) was selected as the inflation device as it is disposable, requires no maintenance (hydrostatic testing) and is readily available at most local refrigeration supply stores.

When inflated, the EFB is approximately 55" x 37" x 12" in size and resembles a large pillow. The bags are individually packaged in 21-1/2" x 8" x 5" cardboard boxes for shipping and storage. The

total weight of a packaged EFB is approximately 6-1/2 pounds.

The EFB is designed to remain "soft" when inflated so that it will mold around obstructions and not be as susceptible to puncture as a "firmly" inflated bag would be. Although a "soft" bag appears to be under inflated, it does provide approximately 450 pounds of buoyancy.

The EFB is NOT designed to be attached to the outside of a boat. To do so will result in the grommets being torn from the bag. If it is absolutely necessary to attach a bag to the outside of a boat, additional strapping, going around the bag, should be used.

Care should be used in the placement of EFBs on a sinking boat so as not to create a dangerously unstable condition. Poorly placed bags can allow a boat to capsize rather than float stable in the water.

CAPSIZING...Contd from page 9

It then becomes a special SAR problem, due to the fact that the overturned boat and the survivors are very difficult to spot, both from the air or the surface. The survival time of the personnel is very limited, depending solely on outside help for their rescue.

I hope that this exploration of the probability that a missing boat will be capsized will contribute to the effectiveness of SAR teams by giving them a better idea of what to expect.

When In Doubt, Play Back The Tapes

In our 1-75 issue we carried some abbreviated comments from a SAR Case Study. One of the critical ones arose from the fact that two widely spread positions had been received by radio and one of them (the wrong one) was accepted without re-playing the tapes to check for accuracy in transcribing the messages.

Another case has just come to light where a fishing vessel broadcast a MAYDAY message, but the vessel could not be raised again. A number of units involved apparently heard different call signs. None heard the caller say he was sinking. No vessels were currently known to be overdue. Because of this and the brevity of the transmission, the case was evaluated as a probable hoax. Search was not started for the vessel until later when it was reported overdue. All survivors were cast up on an island from which they were eventually rescued.

On playing back the Communication Station tapes later, it was found that the recorded transmissions gave the correct call sign and contained the dire statement that the vessel was sinking.

As a result of this case, units involved have been provided a lesson in the importance of tape playback whenever any kind of doubt exists about important transmissions.

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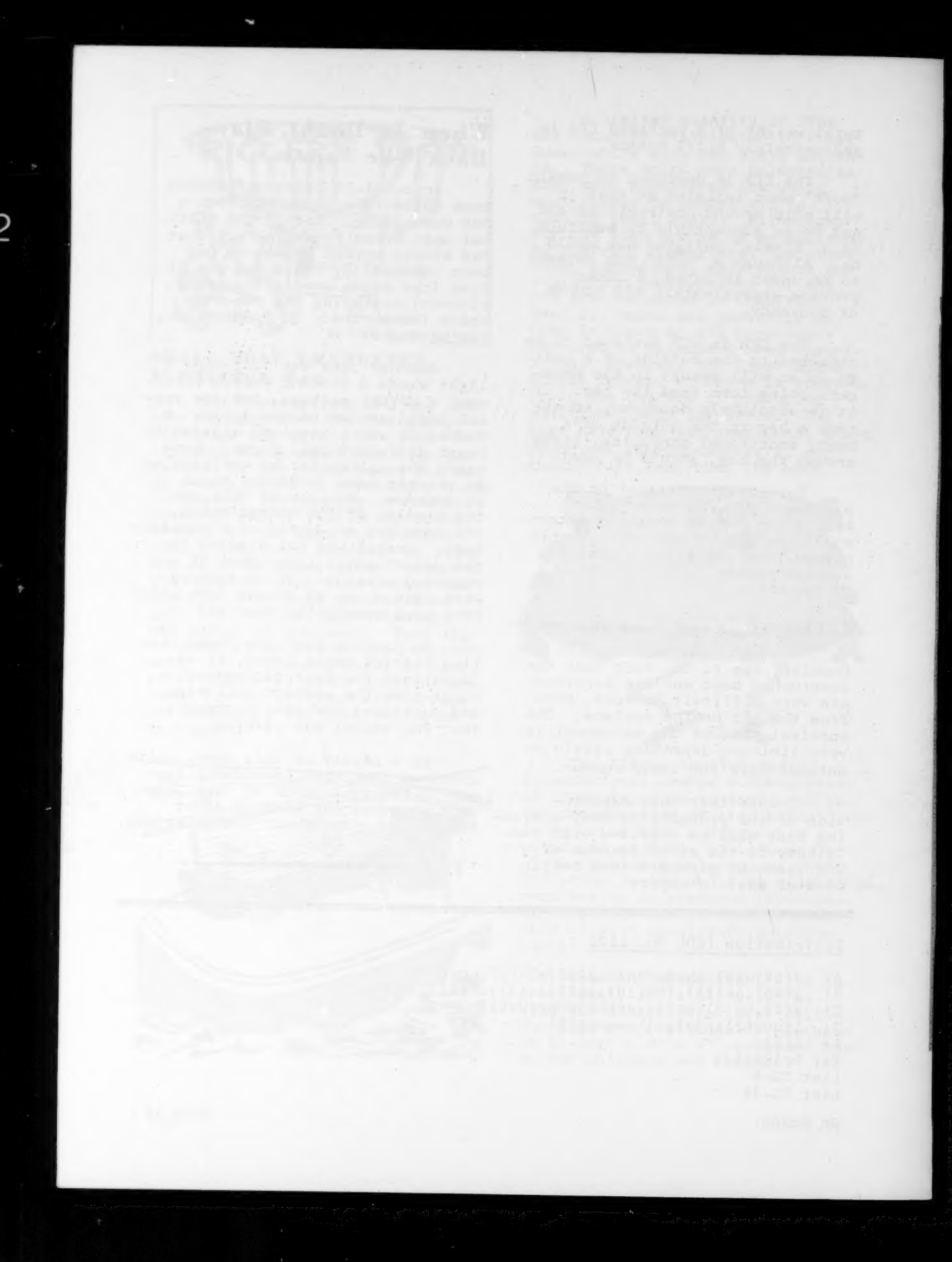
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